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Claims

[c1] 1. A MRI system comprising:

a magnet assembly;

a first cryogen cooling fluid;

a first supply line in communication with said magnet assembly, said first supply line transporting said first cryogen cooling fluid to said magnet assembly;

a first return line in communication with said magnet assembly, said first return line transporting said first cryogen cooling fluid away from said magnet assembly;

a blower assembly positioned between and in communication with said first supply line and said first return line;

a regenerative heat exchanger in communication with said first supply line and said first return line, said regenerative heat exchanger transferring thermal energy from said first supply line to said first return line, said regenerative heat exchanger positioned between said blower assembly and said magnet assembly;

a second supply line transporting a second cryogen fluid; and

a pre-cooler assembly positioned between said regenerative heat exchanger and said magnet assembly, said pre-cooler assembly in communication with said first

supply line and said second supply line, said pre-cooler assembly transferring thermal energy from said first supply line to said second supply line.

[c2] 2. A MRI system as in claim 1 further comprising:
an after-cooler heat exchanger in communication with said first supply line, said after-cooler heat exchanger transferring thermal energy away from said first supply line.

[c3] 3. A MRI system as in claim 1 further comprising:
a make-up gas supply in communication with said first return line, said make-up gas supply positioned between said regenerative heat exchanger and said blower assembly.

[c4] 4. A MRI system as in claim 1 wherein said first cryogen comprises helium and said second cryogen comprises nitrogen.

[c5] 5. A MRI system as in claim 1 wherein:
said pre-cooler assembly comprises:
a source of compressed nitrogen supplying said second supply line; and
a vent in communication with said second supply line, said vent releasing said second cryogen fluid from said second supply line.

[c6] 6. A MRI system as in claim 1 wherein said regenerative heat exchanger is configured such that said first cryogen cooling fluid traveling through said first return line exits said regenerative heat exchanger at substantially room temperature.

[c7] 7. A MRI system as in claim 2 wherein said after-cooler heat exchanger transfers thermal energy from said first supply line into room temperature ambient.

[c8] 8. A MRI system as in claim 2 wherein said after-cooler heat exchanger is positioned between said blower assembly and said magnet assembly.

[c9] 9. A MRI cooling assembly for use with an MRI magnet assembly comprising:
a first cryogen cooling fluid;
a first supply line in communication with the magnet assembly, said first supply line transporting said first cryogen cooling fluid to the magnet assembly;
a first return line in communication with the magnet assembly, said first return line transporting said first cryogen cooling fluid away from the magnet assembly;
a blower assembly positioned between and in communication with said first supply line and said first return line;
an after-cooler heat exchanger positioned between said

blower assembly and the magnet assembly, said after-cooler heat exchanger in communication with said first supply line, said after-cooler heat exchanger transferring thermal energy from said first supply line to room temperature ambient;

a second supply line transporting a second cryogen fluid; and

a pre-cooler assembly positioned between said regenerative heat exchanger and the magnet assembly, said pre-cooler assembly in communication with said first supply line and said second supply line, said pre-cooler assembly transferring thermal energy from said first supply line to said second supply line.

[c10] 10. A MRI cooling assembly as in claim 9, further comprising:

a regenerative heat exchanger in communication with said first supply line and said first return line, said regenerative heat exchanger transferring thermal energy from said first supply line to said first return line, said regenerative heat exchanger positioned between said blower assembly and the magnet assembly.

[c11] 11. A MRI cooling assembly as in claim 10, further comprising:

a make-up gas supply in communication with said first return line, said make-up gas supply positioned between

said regenerative heat exchanger and said blower assembly.

[c12] 12. A MRI cooling assembly as in claim 9, wherein said first cryogen comprises helium and said second cryogen comprises nitrogen.

[c13] 13. A MRI cooling assembly as in claim 9, wherein:
said pre-cooler assembly comprises:
a source of compressed nitrogen supplying said second supply line; and
a vent in communication with said second supply line, said vent releasing said second cryogen fluid from said second supply line.

[c14] 14. A MRI cooling assembly as in claim 10, wherein said regenerative heat exchanger is configured such that said first cryogen cooling fluid traveling through said first return line exits said regenerative heat exchanger at substantially room temperature.

[c15] 15. A MRI cooling assembly as in claim 9 A MRI system as in claim 2 wherein said after-cooler heat exchanger transfers thermal energy from said first supply line into room temperature ambient.

[c16] 16. A method of cooling an MRI magnet comprising:
circulating a first cryogen through the MRI magnet using

a blower assembly, said blower assembly supplying said first cryogen to the MRI magnet using a first supply line, said blower receiving said first cryogen from the MRI magnet using said first return line;

transferring thermal energy from said first supply line to said first return line prior to said first return line entering said blower assembly; and

pre-cooling said first cryogen within said first supply line immediately prior to said first cryogen entering the MRI magnet, said pre-cooling utilizing a second cryogen in thermal communication with said first supply line.

[c17] 17. A method as described in claim 16, further comprising:

transferring thermal energy from said first supply line to room temperature ambient.

[c18] 18. A method as described in claim 16 wherein said first cryogen comprises helium and said second cryogen comprises nitrogen.

[c19] 19. A method as described in claim 17 wherein said transfer of thermal energy from said first supply line to room temperature is performed prior to said transfer of thermal energy from said first supply line to said first return line.

[c20] 20. A method as described in claim 16, wherein said first cryogen is raised to room temperature prior to entering said blower assembly.